An Investigation into the Impact of Gamified Routine Planning / Habit Tracking on Diabetes Management and Glucose

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Project Scope & Objectives

Develop a gamified health planner integrating diabetes management, habit tracking / goal setting, and routine planning. Users can track daily activities, visualize glucose impacts, and stay motivated through gamification (points and streaks). Create a user-friendly, customizable mobile following data protection regulations. Key features include Customisable routine, integrated habit / goal tracking, meal planner and glucose monitoring with visualised data.

Constrains & Limitations

Technical: Efficient data storage is essential for clear visualization and minimal space use. Scalability, real-time sync, and secure access via Firebase are challenging. **Time**: Strict deadlines require prioritizing core features, limiting additional functionality I have thought of. Limited time for thorough testing may affect refinement. **Resources**: Limited expertise with Android Studio and Firebase could slow progress. Having an iOS phone complicates Android testing, and emulator testing may miss real-device behaviour. Having a Windows machine meant I couldn't develop an IOS app. **Regulatory**: GDPR/HIPAA compliance requires secure encryption, user consent, and data control. I must handle data and its deletion correctly.

Methodology - Agile

Agile cycles allow for continuous feedback and refinement, which I will rely on due to having a few very different core features. Its flexibility is also ideal for adapting to any necessary changes throughout development as I may change or find methods that work better for my design.

Project Research and Analysis

My key research focused on understanding user needs for effective diabetes management, evaluating valuable features, and exploring usability challenges. The findings highlighted user demand for simple data logging, motivational gamification, trend visualizations, and customization to suit individual needs. Privacy, ease of use, and reminders are critical. I also looked and evaluated apps their approach to features

Valuable Features: Meal planning, glucose tracking, and reminders are essential (Klinio, n.d.; Glucose Buddy, n.d.).

Importance of Gamification: Streaks and rewards motivate users (Harst et al., 2023), with flexibility like mySugr's customization (mySugr, n.d.) which is crucial to get as many inputs as possible. I will be adding real world discounts as a feature in future. Which I will prototype for now.

Challenges with Tracking: Time and complexity are major barriers for users (should be simple and fast), making a simple interface crucial.This is highlighted by MyDiabetes (Tuah et al., 2021).

Preferred Visualizations: Users prefer trend graphs and alerts, like those in One Drop and Glucose Buddy (One Drop, n.d.; Gluroo, 2024).

Customization Preferences: Customization is crucial for usability, with elderly users preferring simpler layouts (Brew-Sam, 2020).

Additional Insights: Supply reminders, privacy, and GDPR compliance and potential features like community leaderboards or adding friends

Technology and Software

Windows 10: Stable, compatible with Android Studio, though older tools may face issues. **Android Studio**: Chosen for powerful development features and built-in emulator, but resource-heavy. **Firebase**: Provides real-time sync, data security, and easy backend, but has compliance challenges (e.g., GDPR). **Git**: Used for version control. Effective for tracking general use but has a learning curve. **Adobe XD**: Efficient for UI prototyping, though lacks backend capabilities. **Java/Kotlin**: Strong support and integration with Android Studio, though Java needs careful memory management. These technologies were chosen based on project needs—balancing real-time data handling, user experience, and compliance. Constraints include limited iOS compatibility and reliance on emulators for Android testing.

App Design

The app's design emphasizes simplicity and a standout UI, reflecting user research that showed a preference for easy navigation (Tuah et al., 2021). The chosen colours align with my logo, creating a professional look, and follow the theme of NHS / Tech company style. Users can also edit themes. The UI highlights core features like glucose tracking, habit reminders, and meal planning without overcomplicating the home screen. The design deals with constraints such as time limitations by focusing on essential features first The layout aims for balance. Useful insights like Insulin injected and previous entries can be seen on the home views of the data available on other screens. I've included the most crucial two wireframes from the many I have designed.

Analytics and Data Visualization

The app's home screen will feature a daily glucose graph, giving users a clear overview of their glucose levels throughout the day. All the collected data will be visually displayed in an appealing, easy-to-understand way. Users will see metrics like how often they complete their habits, average glucose levels, frequency of highs and lows, and time spent within target range—all presented through interactive graphs, charts, and trend lines. Additionally, habit tracking progress, meal logs, and points earned will be visualized.

Progress and Next Steps

Significant research has been completed, providing a solid foundation for user needs and features. Wireframes are finished, giving a clear visual of the app's general layout. I am currently looking into firebase, while also researching a few gamification aspects like what more user points could be spent on, ideas like real world items discounts in the future.

Research & Planning	Design	Backend Setup	Core Feature Development	Customization & UI	Final User Acceptance	Finnished
Oct 28 – Nov 10, 2024	Nov 11 – Nov 24, 2024	Nov 25 – Dec 8, 2024	Dec 9 - Jan 12, 2025	Jan 13 – Jan 26, 2025	Feb 10 – Mar 2, 2025	March 10

Issues and Considerations

Social	My app will Improve diabetes management and quality of life while minimising the effort needed for data logging to fit busy lifestyles. It will promote diabetes awareness and management to users, motivating individuals to maintain good glucose by reducing stigma around diabetes through gamification and education. There is a community-driven approach to health by sharing milestones by encouraging a healthy lifestyle habits and consistency.
Ethical	My app will prioritize protecting sensitive health data through secure handling and user consent. All health suggestions will be advisory, with major changes (e.g., insulin adjustments) requiring doctor consultation. Transparency is key, both in data handling and collecting user feedback, which will be entirely voluntary. The app aims to prevent harm by ensuring accuracy, maintaining clear communication, and promoting safe health guidance.
EDI	While my apps target audience is diabetic adults around age 20 – 30, I will make sure to prioritizes accessibility across diverse demographics, including elderly users and those with disabilities, by offering features like larger fonts and simplified screens for easier navigation. Brew-Sam (2020) emphasizes the role of customization in empowering users, which supports my inclusion of adaptable UI options to suit different needs and abilities. Gamification, as highlighted by Nasir et al. (2022), helps engage a wider range of users, motivating consistent health behaviour while making health management inclusive and appealing. Addressing the digital divide, my app aims to minimize interaction complexity, ensuring health tracking is accessible to users of all technological backgrounds, as stressed by Tuah et al. (2021) in their research on usability.
Legal	The app must comply with data protection laws, including GDPR and HIPAA, ensuring user privacy and data security. This involves encrypting health data, obtaining explicit user consent, and providing users with control over their data, such as editing or deletion options. Legal considerations also include proper disclaimers for health suggestions—stressing that any insulin or major health changes must be reviewed with a healthcare professional. As highlighted by Brew-Sam (2020), ensuring patient empowerment through data control is key, aligning with legal obligations for transparency and user rights. It must adhere to age restrictions for health-related services, ensuring minors receive appropriate consent before usage
Security	The app must prioritize robust security measures to protect sensitive health data. This includes implementing end-to-end encryption for data in transit and at rest, using secure authentication methods like two-factor authentication, and ensuring proper access controls to prevent unauthorized access. Regular security audits and vulnerability assessments will be performed to address potential weaknesses. Additionally, secure backup systems will be in place to prevent data loss, and compliance with GDPR ensures data is handled responsibly.
Professional Standards	The app development follows established industry standards for software engineering and health applications. Agile methodology is used to ensure iterative improvements based on user feedback, as recommended for health-focused projects (Harst et al., 2023). Compliance with GDPR and HIPAA ensures legal standards for health data protection. Development practices include version control (using Git), code documentation, and adherence to secure coding standards to minimize vulnerabilities. The app also aligns with best practices for usability, accessibility, and inclusivity to cater to a diverse user base, promoting high professional quality.
Project Risks (Rating / 10)	Several risks could impact the project, each rated by severity. **Data Security Breach (9)**: Health data breaches could severely impact users, requiring strong encryption and compliance protocols. **Scope Creep (8)**: Adding features beyond initial scope could delay project completion, managed through strict feature prioritization. **Technical Challenges (7)**: Issues with Firebase integration or Android Studio could slow development. **User Adoption (6)**: Users may find the app complex or not adopt it, mitigated through usability testing and simplified UI. **Compliance Issues (7)**: GDPR or HIPAA non-compliance could lead to legal problems, requiring careful attention to regulations. **Limited Testing on Android Devices (6)**: Due to the lack of Android phones for testing, some issues may be missed, mitigated through emulator use. **Time Management (5)**: Tight deadlines could lead to incomplete features; Agile planning helps keep tasks on track. **Data Loss (7)**: Potential for data loss during development, managed through frequent backups and version control.

Professional Skills

Development	The project follows a full development life cycle—research, design, implementation, testing, and final evaluation. Each phase is guided by Agile methodology, emphasizing continuous improvement and adaptability. Through this process, I've learned to refine requirements based on user feedback, manage time effectively, and adapt to challenges like technical integration with Firebase. The life cycle approach has also enhanced my problem-solving and planning skills, crucial for future full-stack development roles.
Project management	Managing the project involves defining clear milestones, creating detailed timelines, and effectively allocating resources. Tools like Gantt charts and project management software have been utilized to keep track of progress, identify delays, and adjust schedules as needed. I've learned to identify and manage risks, control scope to avoid unnecessary expansion, and keep priorities aligned with project goals. Effective communication and progress monitoring have been crucial, enabling me to maintain focus across all project stages. Balancing technical work with strategic oversight has improved my time management and leadership abilities, preparing me for future roles in managing complex projects.
Agile	The project follows an Agile approach, emphasizing adaptability, user- centred development, and iterative progress. Each development cycle involves gathering user feedback, implementing changes, and refining features, allowing for continuous improvement. I've learned to effectively prioritize tasks through backlog management, manage evolving requirements, and ensure timely deliverables without compromising quality. Agile practices such as daily stand-ups and sprint planning have strengthened my skills in collaboration and proactive problem-solving. This approach has made me more responsive to change and focused on delivering consistent value throughout the project.

References and images

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